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(54) Helmet

Helm

Casque

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- **PATENT ABSTRACTS OF JAPAN vol. 14, no. 134 (C-701)(4077) 14 March 1990 & JP-A-20 06 607 (SHOEI KAKO K.K.)**

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Description

This invention relates to helmets.

Japanese Patent Publication No. 1118/74 discloses a helmet which includes an air duct formed in a groove-like fashion in a surface of the shock-absorbing liner opposed to the shell. With the helmet having such a structure, the air duct cannot be clogged with wearer's hair, resulting in good ventilation, as compared with the helmet having an air duct provided in an inner surface of the shock absorbing liner.

However, it has been found that the ventilating ability of such a helmet, in practice, may be lower than expected, for the following reason.

Helmets made in recent years are often formed from fibre reinforced plastics (FRP) and have an inner surface which is rough due to the exposure of reinforcing fibres. For this reason, there are a plurality of fine gaps between the shell and the shock absorbing liner over the entire interface between the shell and the shock absorbing liner. If these gaps communicate with the air duct, air-flow leaks from the air duct, thereby reducing the flow rate in the air duct and reducing the available ventilation.

EP-A-0474939 discloses a helmet, including a cap body comprising a shell and a shock absorbing liner fitted to an inner surface of the shell, and a longitudinally extending air duct which is provided in the shock absorbing liner of the cap body, such that the inside of the cap body can be ventilated through the air duct.

US 4,006,496 discloses a helmet with a dual shock liner system comprising a resilient damping layer coacting with a shock absorbing liner.

According to the present invention, at least a portion of the shock absorbing liner is divided into a liner body having a recess in an outer surface thereof and an outer layer on the side of the shell, a bottom wall of the recess defining an inner layer, the outer layer being fitted into the recess so that the outer layer is superimposed on the inner layer, a groove being provided in one or both of the opposed surfaces of the inner and outer layers, the groove defining the air duct, the inner layer having a vent hole which opens into an inner surface of the cap body to communicate the interior of the cap body with the air duct.

With the above construction, a peripheral edge of the groove-like air duct can be sealed by superposed surfaces of the inner and outer layers irrespective of the presence of gaps between the opposed surfaces of the shell and the shock absorbing liner. Therefore, air flowing into the air duct can be allowed to flow at a high rate without any leakage, thereby reliably ventilating the inside of the cap body through the vent hole in the inner layer. In addition, the outer layer serves to thermally insulate the air duct from ambient heat, thereby providing a comfortable ventilated condition even in the summer.

For a better understanding of the present invention and to show how it may be carried into effect reference will now be made by way of example to the accompanying drawings, in which:

Fig.1 is a side view of a helmet according to a first embodiment of the present invention;
Fig.2 is an enlarged sectional view taken along a line 2-2 in Fig.1;
Fig.3 is a sectional view taken along a line 3-3 in Fig.2;
Fig.4 is an exploded perspective view of a shock absorbing liner of the helmet;
Fig.5 is a side view of a helmet according to a second embodiment of the present invention;
Fig.6 is an enlarged sectional view taken along a line 6-6 in Fig.5;
Fig.7 is an enlarged sectional view taken along a line 7-7 in Fig.6;
Fig.8 is an enlarged view of a portion indicated by 8 in Fig.7;
Fig.9 is a view taken along an arrow 9 in Fig.8; and
Fig.10 is a sectional view taken along a line 10-10 in Fig.8.

The present invention will now be described by way of a first embodiment.

Referring to Fig.1, a cap body 1 is constructed into a full-face type including a chin covering portion 1a immediately below a window opening 2 in a front surface thereof. A visor 3 is pivotally supported at opposite ends on left and right opposite sides of the cap body 1 in such a manner to open and close the window opening 2.

Provided in an outer surface of the cap body 1 are a pair of left and right inlet ports 4, 4 opened immediately above the window opening 2, and a pair of outlet ports 5, 5 opened in rear and lower portions of the cap body 1. The cap body 1 is provided with air ducts 6, 6 each interconnecting the inlet port 4 and the outlet port 5 on each side.

Referring to Figs.2 and 3, the cap body 1 is comprised of a shell 10 made of FRP, and a shock absorbing liner 11 of an expanded polystyrene fitted to an inner surface of the shell 10. A top pad 12 and a fit pat 13 each made of urethane foam and having an air-permeability or breathability are applied to an inner surface of the liner 12.

As shown in Fig.4, the shock absorbing liner 11 is divided into a main liner section 14 fitted to a main portion of the shell 10 excluding the chin-covering portion 1a, and a chin-covering portion liner section 15 fitted to the chin-covering portion 1a of the shell 10. Further, as shown in Figs.2 to 4, the main liner section 14 is divided into a main liner body 14_1 provided in an upper surface thereof with a groove-like recess 16 extending along the longitudinal center line of the cap body 1, and an outer layer 14_2 fitted into the recess 16. A portion of the main liner body 14_1 constituting a bottom wall of the recess 16 is an inner layer 14_1a. The outer layer 14_2 has an expansion multiple which is set smaller than that of the

inner layer 14_1a, i.e., of the main liner body 14_1. Therefore, the outer layer 14_2 has a density higher than that of the main liner body 14_1.

Recessed grooves 17, 17; 18 18 are provided in opposed surfaces of the inner layer 14_1 and the outer layer 14_2 to constitute the air ducts 6, 6, respectively. A plurality of air vent holes 19, 19 --- are provided in the inner layer 14_1a to permit the communication of each of the air ducts 6 with an inner surface of the main liner body 14_1. Each of the inlet ports 4 is comprised of a through hole 4a extending through a front wall of the shell 10 to communicate with a front end of the corresponding air duct 6, and a notch 4b (Fig. 4) provided in a front end wall of the recess 16 in the main liner body 14_1.

The left and right inlet ports 4, 4 are disposed in proximity to each other at a central portion of a front surface of the cap body 1. Thus, the left and right inlet ports 4, 4 can be opened and closed by a single common inlet shutter 7 attached to the shell 10, and air-stream can be effectively introduced through the central portion of the front surface of the cap body 1. A space between the left and right air ducts 6, 6 is likewise set narrower at their front ends communicating with the inlet ports 4, 4 but becomes gradually wider with distance apart rearwardly from the inlet ports 4, 4, thereby permitting a ventilation to be produced in an increased extent within the cap body 1.

A cover 8 opened at its lower portion is mounted on the outer surface of the cap body 1 to cover an externally opened end of each of the outlet ports 5.

The operation of this embodiment of the present invention will be described below.

If a driver of a vehicle, e.g., motorcycle wears the cap body 1 on his head, and opens the inlet shutter 7 to open the inlet ports 4, 4 during travelling of a motorcycle, air-stream generated upon travelling of the vehicle exerts a dynamic pressure to the inlet ports 4, 4, and flowing of the air-stream along the outer surface of the cap body 1 causes a negative pressure generated at the rear portion of the cap body 1 to be applied to the outlet ports 5, 5.

The air-stream is passed from the inlet port 4, 4 through the air ducts 6, 6 toward the outlet ports 5, 5 by the application of such dynamic and negative pressures.

Peripheral edges of the recessed grooves 17 and 18 constituting each of the air ducts 6 are reliably sealed by the inner and outer layers 14_1a and 14_2 fitted with each other. Therefore, the air-stream flowing into each of the air ducts 6 is not leaked and thus, can pass through the air duct 6 at a high rate.

According to the system of such flowing of the air-stream through the air duct 6, in the air vent hole 19 closer to the inlet port 4, air is introduced through the air duct 6 into the shock absorbing liner 11, and in the other air vent hole 19, air warmed in the liner 11 is drawn into the air duct 6, as shown by an arrow in Fig.3, thereby effectively ventilating the inside of the cap body 1. The intensity of the ventilation can be controlled by adjusting the opening degree of the inlet shutter 7.

If a shock force is applied to a top of the outer surface of the cap body 1 due to a crash or the like, a relatively small shock energy can be absorbed by the inner layer 14_1a of a lower density, while a relatively large shock energy can be absorbed by the outer layer 14_2 of a higher density and as a result, the transmission of the shock force to the driver's head can be moderated effectively.

It will be understood that various modifications in design can be made in the above-described embodiment without departing from the principle of the present invention. For example, the recessed groove 17 or 18 may be provided as the air duct 6 only in one of the opposed surfaces of the inner and outer layers 14_1a and 14_2. In addition, the present invention is applicable to other types of helmet such as an open-face type and the like.

A second embodiment of the present invention will now be described, wherein parts or components corresponding to those in the first embodiment are designated by the same reference characters as in the first embodiment, and the detailed description thereof is omitted herein.

In the second embodiment, the above-described outlet ports are replaced by a pair of first left and right outlet ports 20, 20 provided in the outer surface of the cap body 1 and opened into the top thereof, and a pair of second left and right outlet ports 30, 30 also provided in the outer surface of the cap body 1 and opened into the lower surface of the rear portion thereof. The ports 20 and 30 on the same side are connected to a pair of corresponding left and right air ducts 6, 6, respectively.

Each of the first outlet ports 20 is comprised of through-holes 20a and 20b which extend through the tops of the shell 10 and the outer layer 14_2 so as to communicate with an intermediate portion of the corresponding air duct 6. Each of the second outlet ports 30 is comprised of a groove formed in the lower portion of the back surface of the liner body 14_1 so as to communicate with a rear end of the corresponding air duct 6.

The first outlet ports 20, 20 are opened and closed by outlet shutters 21, 21 independently operated, respectively.

Each of the outlet shutters 21 is comprised of a shutter housing 23 secured to the outer surface of the shell 10 by a machine screw 22, and a shutter plate 24 slidably carried on the shutter housing 23 for opening and closing an outer opened end of the first outlet port 20, as shown in Figs.8 to 10. The shutter housing 23 is generally in a flat and streamline form and is provided with a small chamber 25 into which an upper end of the first outlet port 20 is opened, and a flow-out opening 26 through which the small chamber 25 is opened rearwardly. The flow-out opening 26 is divergent rearwardly. The shutter housing 23 is also provided with a guide groove 27 extending forwardly from the small chamber 25, and an elongated hole 28 opened into the guide

groove 27. The shutter plate 24 is slidably received in the guide groove 27, and a knob 29 formed on a front end of the shutter plate 24 is slidably received in the elongated hole 28.

The shutter plate 24 includes a pair of left and right resilient claws 24a, 24a. And two pairs of front and rear projections 27a, 27a, 27b and 27b are formed on left and right sidewalls of the guide groove 27 for engagement with the resilient claws to retain the shutter plate 24 alternately at a front opened position A and a rear closed position B. The shutter plate 24 opens the first outlet port 20 at its opened position A. and closes the port 20 at its closed position B.

The operation of the second embodiment will be described below.

If a driver of the vehicle, e.g., a motorcycle wears the cap body 1 on his head, and opens the inlet shutter 7 to open the inlet ports 4, 4 during travelling of the vehicle, air-stream exerts a dynamic pressure to the inlet ports 4, 4. Flowing of the air-stream along the outer surface of the cap body 1 causes a negative pressure generated at the rear portion of the cap body 1 to be applied to the outlet ports 5, 5. A negative pressure is generated in the flow-out opening 26 in the outlet shutter 21 and the second outlet port 30. The negative pressure generated in the flow-out opening 26 is applied through the small chamber 25 to the first outlet port 20. The application of such dynamic pressure and the negative pressure causes the air-stream to flow from the inlet ports 4, 4 through the air ducts 6, 6 toward the first and second outlet ports 20 and 30.

Particularly, since the first and second outlet ports 20 and 30 are provided in the top and the lower end of the rear portion of the cap body 1, even if the angle of forward inclination of the cap body 1 is varied in any way due to a variation in attitude of the driver, a strong negative pressure can be always generated in either one of the first and second outlet ports 20 and 30 and thus, the inside of the cap body 1 can be always ventilated effectively.

The degree of the ventilation within the cap body 1 can be finely adjusted by closing either one, two or all of the inlet shutter 7 and the outlet shutters 21, 21.

It will be understood that various modifications in design can be made in the second embodiments without departing from the principle of the present invention. For example, a shutter may be provided even over the second outlet port 6 for opening and closing the latter.

Claims

1. A helmet, including a cap body (1) comprising a shell (10) and a shock absorbing liner (11) fitted to an inner surface of the shell (10), and a longitudinally extending air duct (6) which is provided in the shock absorbing liner (11) of the cap body (1), such that the inside of the cap body (1) can be ventilated through the air duct, characterised in that
at least a portion of the shock absorbing liner (11) is divided into a liner body (14_1) having a recess (16) in an outer surface thereof, and an outer layer (14_2) on the side of the shell (10), a bottom wall of the recess (16) defining an inner layer, the outer layer (14_2) being fitted into the recess (16) so that said outer layer is superimposed on the inner layer, a groove (17, 18) being provided in one or both of the opposed surfaces of the inner and outer layers, the groove (17, 18) defining the air duct (6), the inner layer having a vent hole (19) which opens into an inner surface of the cap body (1) to communicate the interior of the cap body (1) with the air duct (6).

2. A helmet as claimed in claim 1, characterized in that the shock absorbing liner (11) is made of expanded polystyrene, and the outer layer (14_2) has an expansion multiple smaller than that of the inner layer.

3. A helmet as claimed in any one of the preceding claims, characterized in that the cap body (1) includes an inlet port (4) having a shutter (7) and opened into a front surface of the cap body (1) to communicate with a front end of the air duct (6), and an outlet port (5) opened into a rear and lower portion of the cap body (1) to communicate with a rear end of the air duct (6).

4. A helmet as claimed in claim 3, characterized in that the inlet and outlet ports (4, 5) are defined by recesses provided in opposed surfaces of the inner layer and outer layer (14_2).

5. A helmet as claimed in claim 1 or 2, characterized in that the cap body (1) is provided at a front portion thereof with an inlet port (4) for introducing outside air into the air duct, and is also provided at a top portion and a rear portion of the cap body with first and second outlet ports (20, 30) for drawing the air out of the air duct (6).

6. A helmet as claimed in claim 5, characterized in that a pair of left and right inlet ports (4,4) are disposed in proximity to each other at a central portion of the front surface of the cap body (1), and the left and right air ducts (6,6) communicating with the inlet ports (4, 4) are formed such that a distance between the air ducts (6, 6) becomes gradually larger toward a rearward direction from the inlet ports (4, 4).

7. A helmet as claimed in claim 6, characterized in that there is further provided a single common inlet shutter (7) capable of opening and closing the pair of left and right inlet ports (4, 4).

8. A helmet as claimed in any one of claims 5 to 7, characterized in that there are further provided left and right outlet shutters (21, 21) mounted to at least

one of a pair of the first outlet ports (20, 20) and a pair of the second outlet ports (30, 30) communicating with the left and right air ducts (6, 6), the shutters (21, 21) being capable of independently opening and closing the outlet ports (20, 30).

Patentansprüche

1. Helm, umfassend: einen Kappenkörper (1) mit einer Schale (10) und einer an die Innenfläche der Schale (10) angesetzten stoßabsorbierenden Auskleidung (11), sowie eine in Längsrichtung verlaufende Luftleitung (6), die in der stoßabsorbierenden Auskleidung (11) des Kappenkörpers (1) vorgesehen ist, so daß die Innenseite des Kappenkörpers (1) durch die Luftleitung gelüftet werden kann, **dadurch gekennzeichnet**, daß
zumindest ein Teil der stoßabsorbierenden Auskleidung (11) in einen Auskleidungskörper (14_1), der in seiner Außenfläche einer Vertiefung (16) aufweist, und eine Außenschicht (14_2) an der Seite der Schale (10) unterteilt ist, wobei eine Bodenwand der Vertiefung (16) eine Innenschicht festlegt, wobei die Außenschicht (14_2) in die Vertiefung (16) derart eingesetzt ist, daß die Außenschicht über der Innenschicht liegt, wobei eine Nut (17, 18) in einer oder beiden der gegenüberliegenden Flächen der Innen- und Außenschicht vorgesehen ist, wobei die Nut (17, 18) die Luftleitung (6) festlegt, wobei die Innenschicht ein Lüftungsloch (19) aufweist, das sich in eine Innenfläche des Kappenkörpers (1) öffnet, um das Innere des Kappenkörpers (1) mit der Luftleitung (6) zu verbinden.

2. Helm nach Anspruch 1, **dadurch gekennzeichnet**, daß die stoßabsorbierende Auskleidung (11) aus geschäumtem Polystyrol hergestellt ist und der Aufschäumungsfaktor der Außenschicht (14_2) geringer als jener der Innenschicht ist.

3. Helm nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß der Kappenkörper (1) einen Einlaßdurchgang (4), der einen Verschluß (7) aufweist und sich in eine Vorderfläche des Kappenkörpers (1) öffnet, um mit einem Vorderende der Luftleitung (6) zu kommunizieren, sowie einen Auslaßdurchgang (5), der sich in einen hinteren und unteren Teil des Kappenkörpers (1) öffnet, um mit dem hinteren Ende der Luftleitung (6) zu kommunizieren, umfaßt.

4. Helm nach Anspruch 3, **dadurch gekennzeichnet**, daß die Einlaß- und Auslaßdurchgänge (4, 5) durch in gegenüberliegenden Flächen der Innen- und Außenschicht (14_2) vorgesehene Vertiefungen festgelegt sind.

5. Helm nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß der Kappenkörper (1) an seinem Vorderabschnitt mit einem Einlaßdurchgang (4) zum Einführen von Umgebungsluft in die Luftleitung versehen ist, und ferner an einem oberen Teil und einem hinteren Teil des Kappenkörpers mit ersten und zweiten Auslaßdurchgängen (20, 30) zum Saugen der Luft aus der Luftleitung (6) versehen ist.

6. Helm nach Anspruch 5, **dadurch gekennzeichnet**, daß ein Paar linker und rechter Einlaßdurchgänge (4, 4) nahe beieinander an einem Mittelteil der Vorderfläche des Kappenkörpers (1) angeordnet ist und die mit den Einlaßdurchgängen (4, 4) kommunizierenden linken und rechten Luftleitungen (6, 6) derart geformt sind, daß ein Abstand zwischen den Luftleitungen (6, 6) von den Einlaßdurchgängen (4, 4) in Richtung nach hinten allmählich größer wird.

7. Helm nach Anspruch 6, **dadurch gekennzeichnet**, daß ferner ein einzelner gemeinsamer Einlaßverschluß (7) vorgesehen ist, mit dem sich das Paar linker und rechter Einlaßdurchgänge (4, 4) öffnen und schließen läßt.

8. Helm nach einem der Ansprüche 5 bis 7, **dadurch gekennzeichnet**, daß ferner linke und rechte Auslaßverschlüsse (21, 21) vorgesehen sind, die an zumindest einem eines Paars der ersten Auslaßdurchgänge (20, 20) und eines Paars der zweiten Auslaßdurchgänge (30, 30), die mit den linken und rechten Luftleitungen (6, 6) kommunizieren, angebracht sind, wobei sich mit den Verschlüssen (21, 21) die Auslaßdurchgänge (20, 30) unabhängig öffnen und schließen lassen.

Revendications

1. Casque, comportant un corps coiffant (1) qui comprend une coque (10) et une doublure d'amortissement des chocs (11) fixée à une surface intérieure de la coque (10), et un conduit d'aération (6) s'étendant longitudinalement, qui est ménagé dans la doublure d'amortissement des chocs (11) du corps coiffant (1), de telle sorte que l'intérieur du corps coiffant (1) puisse être ventile par l'intermédiaire du conduit d'aération, caractérisé en ce que
au moins une partie de la doublure d'amortissement des chocs (11) est divisée en un corps de doublure (14_1) présentant un renfoncement (16) dans une surface extérieure, et en une couche extérieure (14_2) située du côté de la coque (10), une paroi de fond du renfoncement (16) définissant une couche intérieure, la couche extérieure (14_2) étant fixée dans le renfoncement (16) de telle sorte que ladite couche extérieure soit superposée à la couche intérieure, une rainure (17, 18) étant ménagée dans l'une des surfaces en vis-à-vis des couches intérieure et extérieure ou dans ces deux surfaces, la rainure (17, 18) définissant le conduit

d'aération (6), la couche intérieure ayant un trou d'échappement (19) qui s'ouvre sur une surface intérieure du corps coiffant (1) afin de mettre en communication l'intérieur du corps coiffant (1) avec le conduit d'aération (6).

2. Casque tel que défini dans la revendication 1, caractérisé en ce que la doublure d'amortissement des chocs (11) est constituée de polystyrène expansé, et la couche extérieure (14_2) a un degré d'expansion plusieurs fois plus faible que celui de la couche intérieure.

3. Casque tel que défini dans l'une quelconque des revendications précédentes, caractérisé en ce que le corps coiffant (1) comporte un orifice d'entrée (4) muni d'un obturateur (7) et s'ouvrant sur une surface avant du corps coiffant (1) afin de communiquer avec une extrémité avant du conduit d'aération (6), et un orifice de sortie (5) s'ouvrant dans une partie arrière et inférieure du corps coiffant (1) afin de communiquer avec une extrémité arrière du conduit d'aération (6).

4. Casque tel que défini dans la revendication 3, caractérisé en ce que les orifices d'entrée et de sortie (4, 5) sont définis par des évidements ménagés dans des surfaces en vis-à-vis de la couche intérieure et de la couche extérieure (14_2).

5. Casque tel que défini dans la revendication 1 ou 2, caractérisé en ce que le corps coiffant (1) est pourvu, sur une partie avant, d'un orifice d'entrée (4) permettant l'introduction d'air extérieur dans le conduit d'aération, et est également pourvu, sur une partie supérieure et une partie arrière du corps coiffant, de premier et second orifices de sortie (20, 30) permettant à l'air d'être extrait du conduit d'aération (6).

6. Casque tel que défini dans la revendication 5, caractérisé en ce que deux orifices d'entrée gauche et droit (4, 4) sont disposés à proximité l'un de l'autre sur une partie centrale de la surface avant du corps coiffant (1), et les conduits à air gauche et droit (6, 6), communiquant avec les orifices d'entrée (4, 4), sont formés de telle façon que la distance entre les conduits à air (6, 6) devienne progressivement plus grande en allant vers l'arrière depuis les orifices d'entrée (4, 4).

7. Casque tel que défini dans la revendication 6, caractérisé en ce qu'il est, en outre, prévu un obturateur d'entrée commun unique (7) apte à ouvrir et fermer les deux orifices d'entrée gauche et droit (4, 4).

8. Casque tel que défini dans l'une quelconque des revendications 5 à 7, caractérisé en ce qu'il est, en outre, prévu des obturateurs de sortie gauche et droit (21, 21) montés sur au moins l'une d'une paire de premiers orifices de sortie (20, 20) et d'une paire de seconds orifices de sortie (30, 30), communiquant avec les conduits à air gauche et droit (6, 6), les obturateurs (21, 21) étant aptes à ouvrir et fermer séparément les orifices de sortie (20, 30).

FIG.1

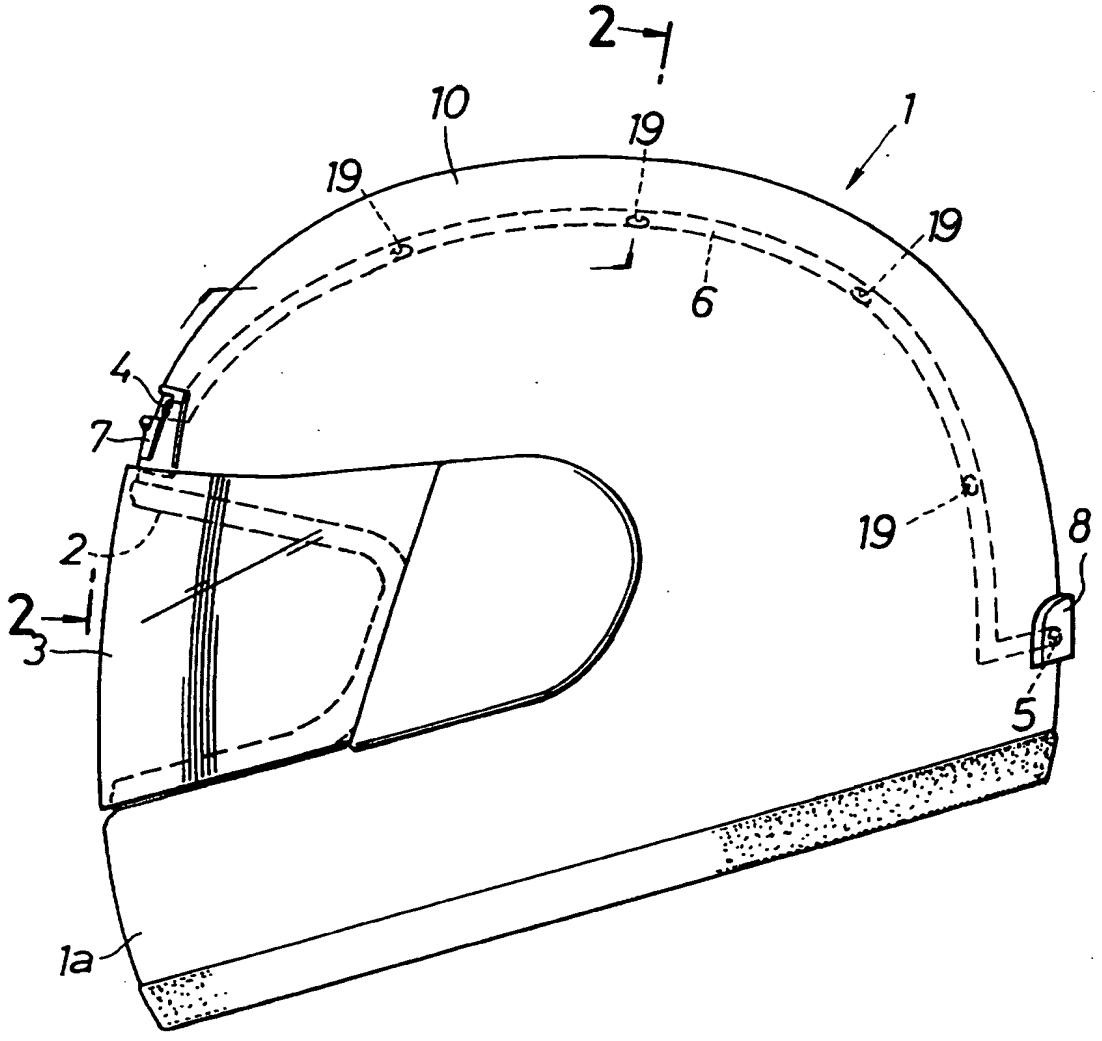


FIG.2

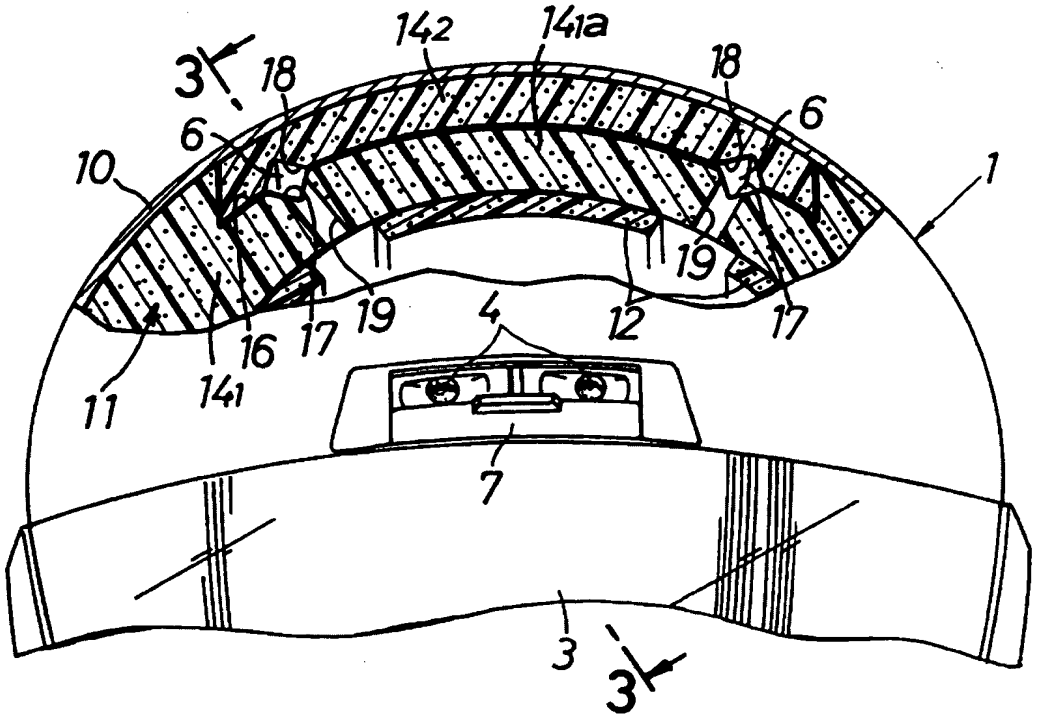


FIG.3

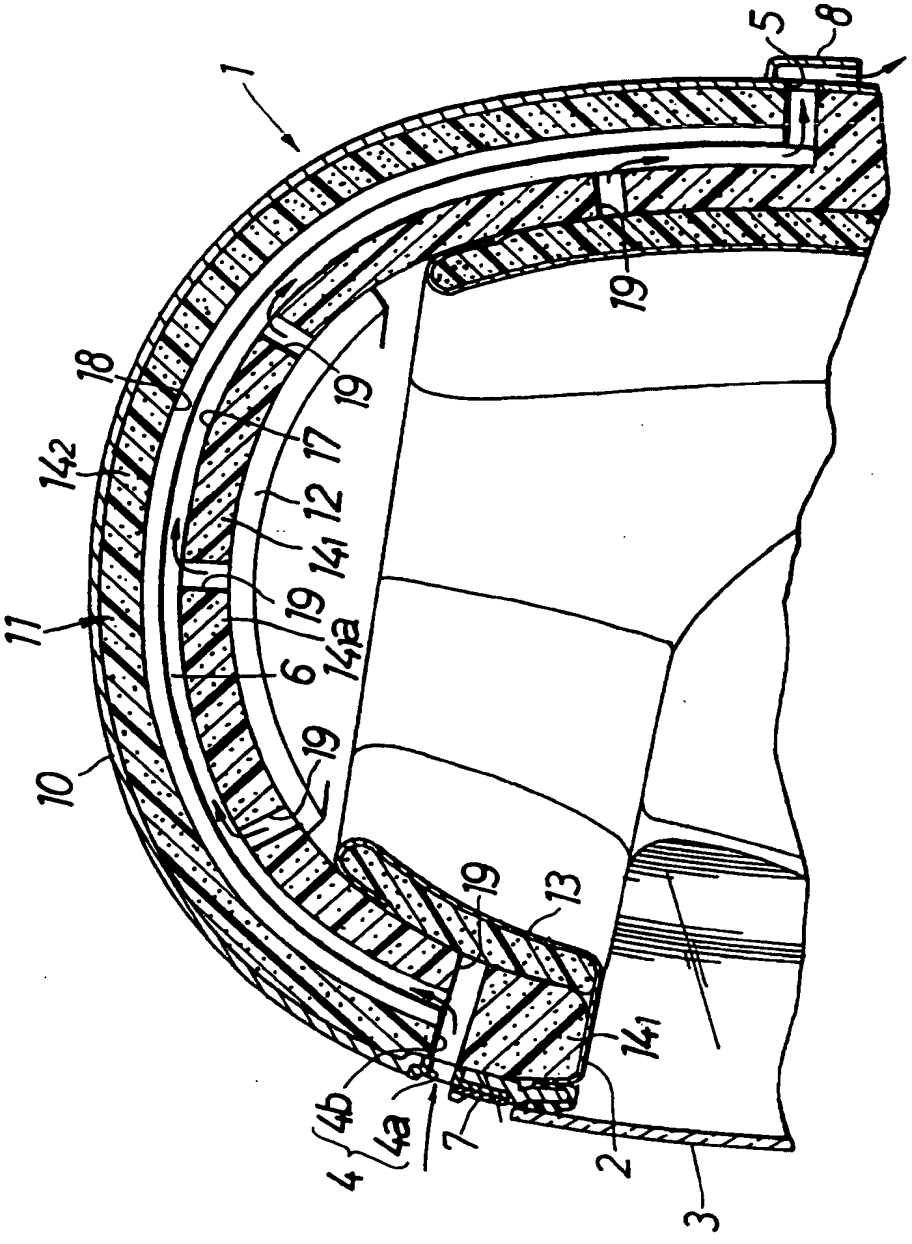


FIG.4

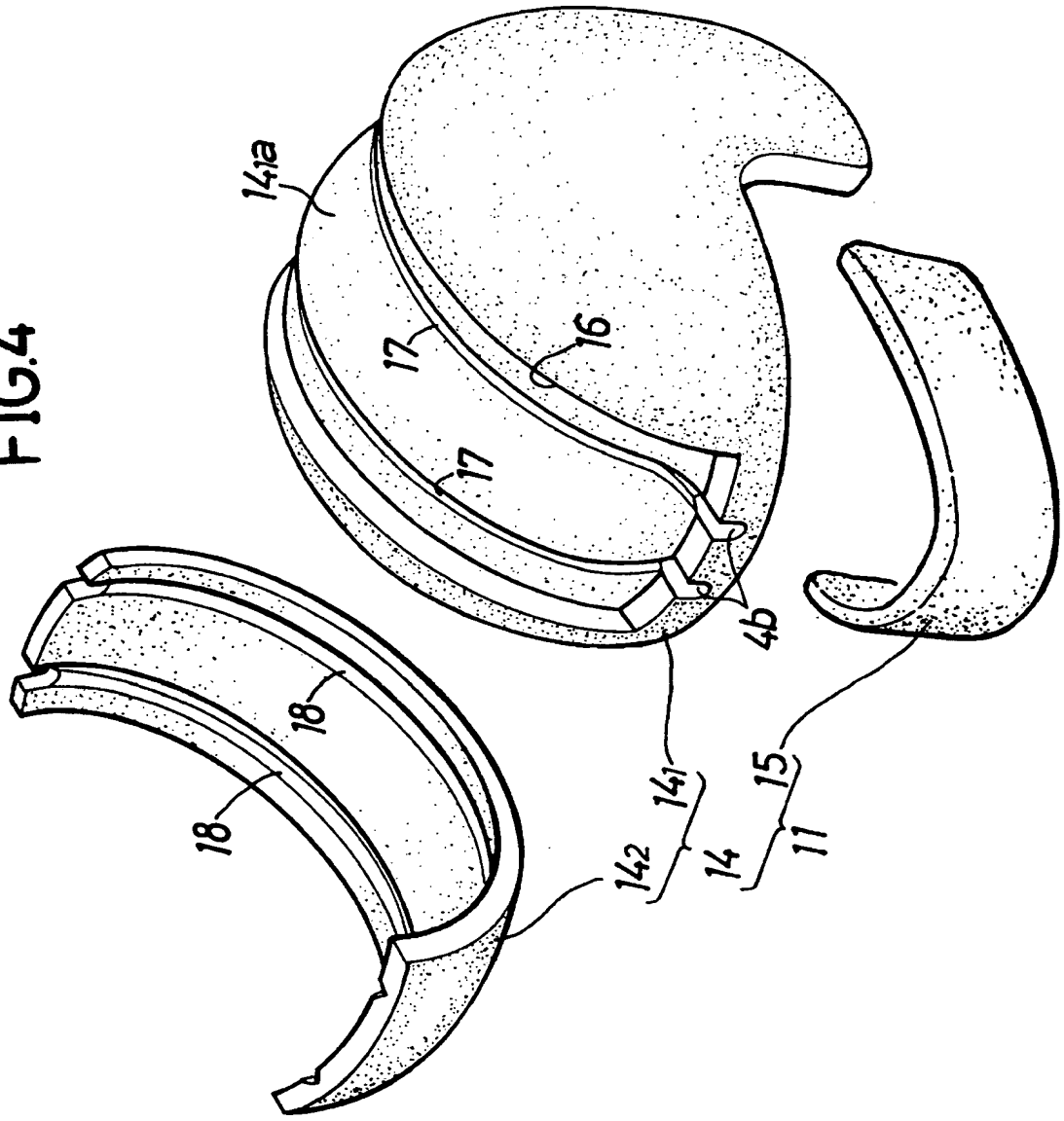


FIG.5

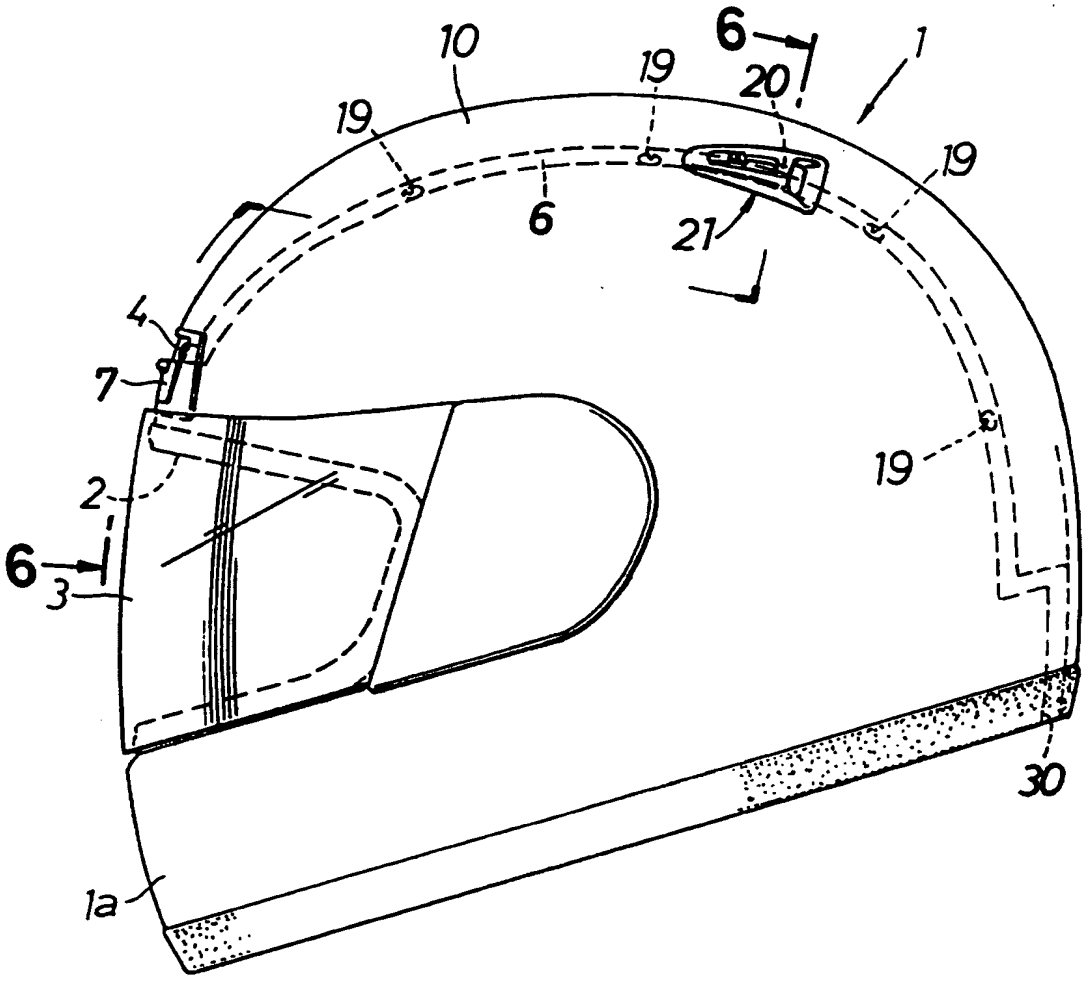


FIG.6

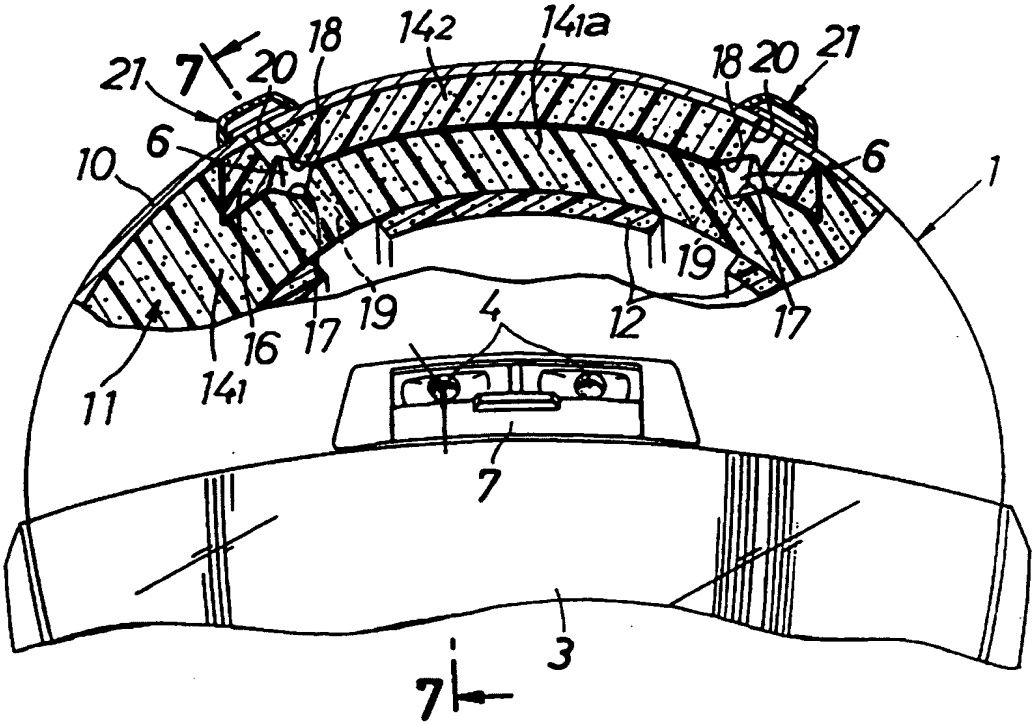
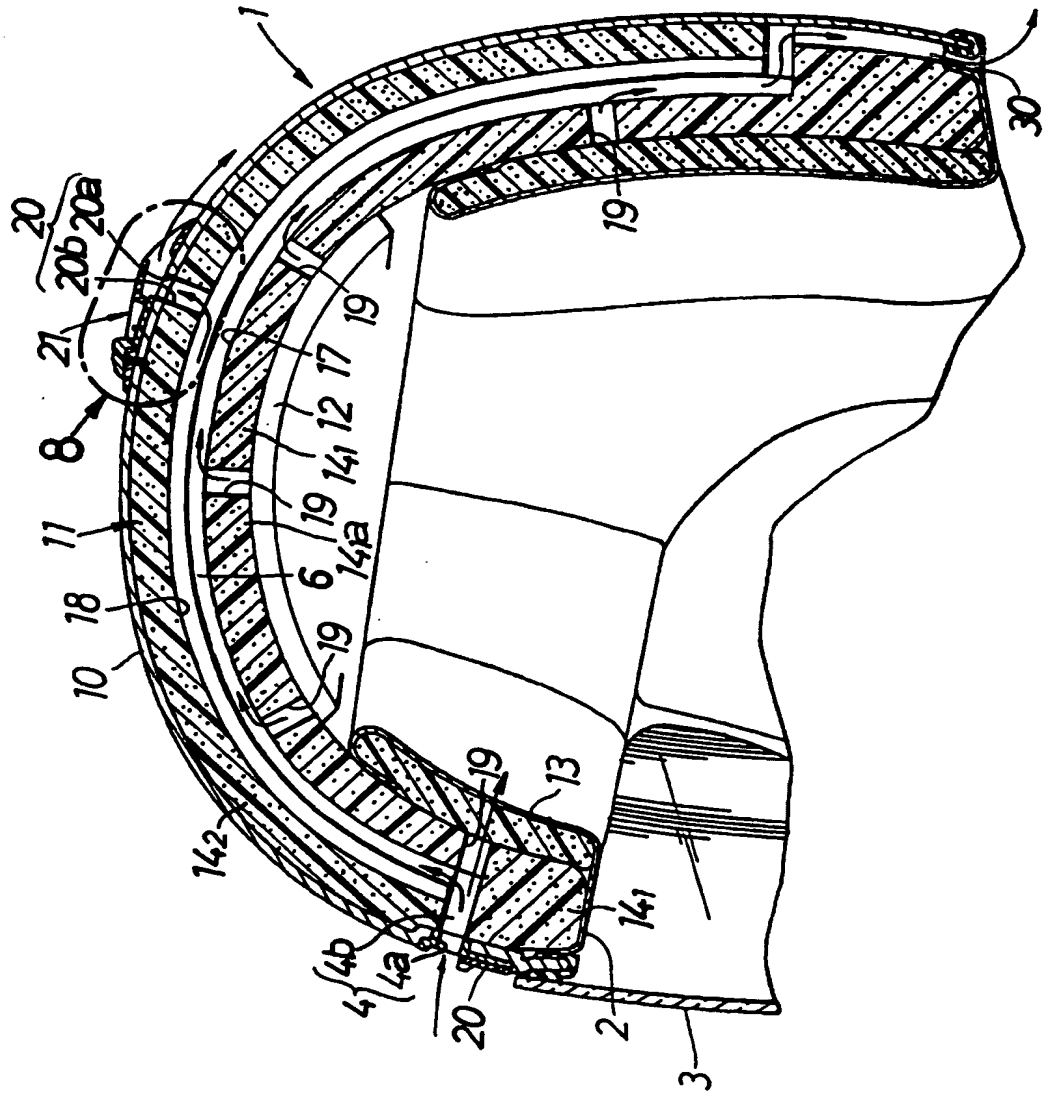


FIG.7


1
30
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20
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11
142a
6
18
19
10
19
13
142
141
4b
4a
4
20
2
3

FIG.8

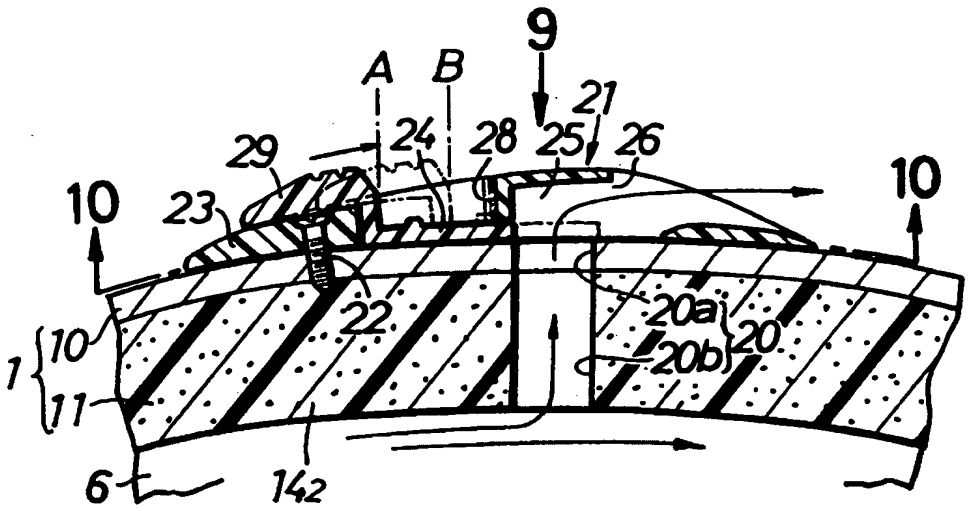


FIG.9

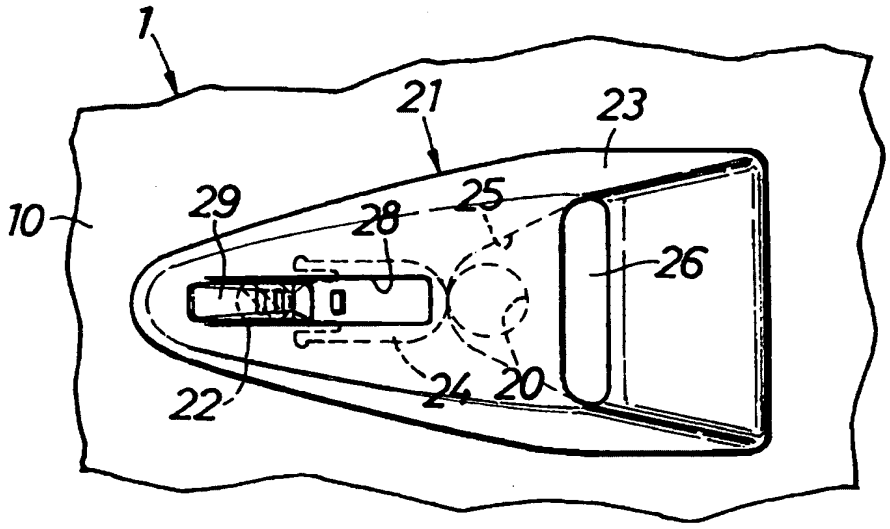
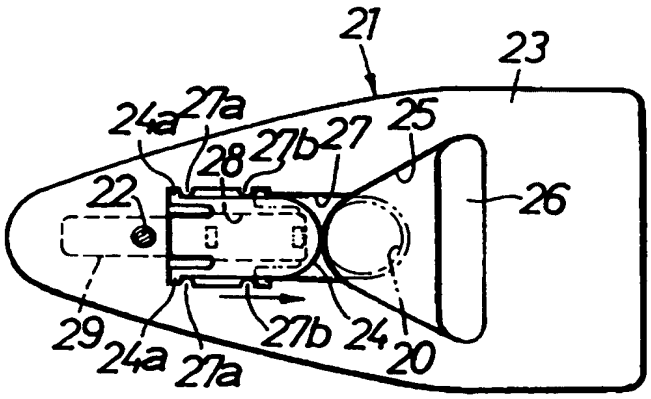

1
21
23
10
29
28
25
26
22
24
20

FIG.10


21
23
24a
27a
28
27b
27
25
22
26
29
24a
27a
27b
24
20